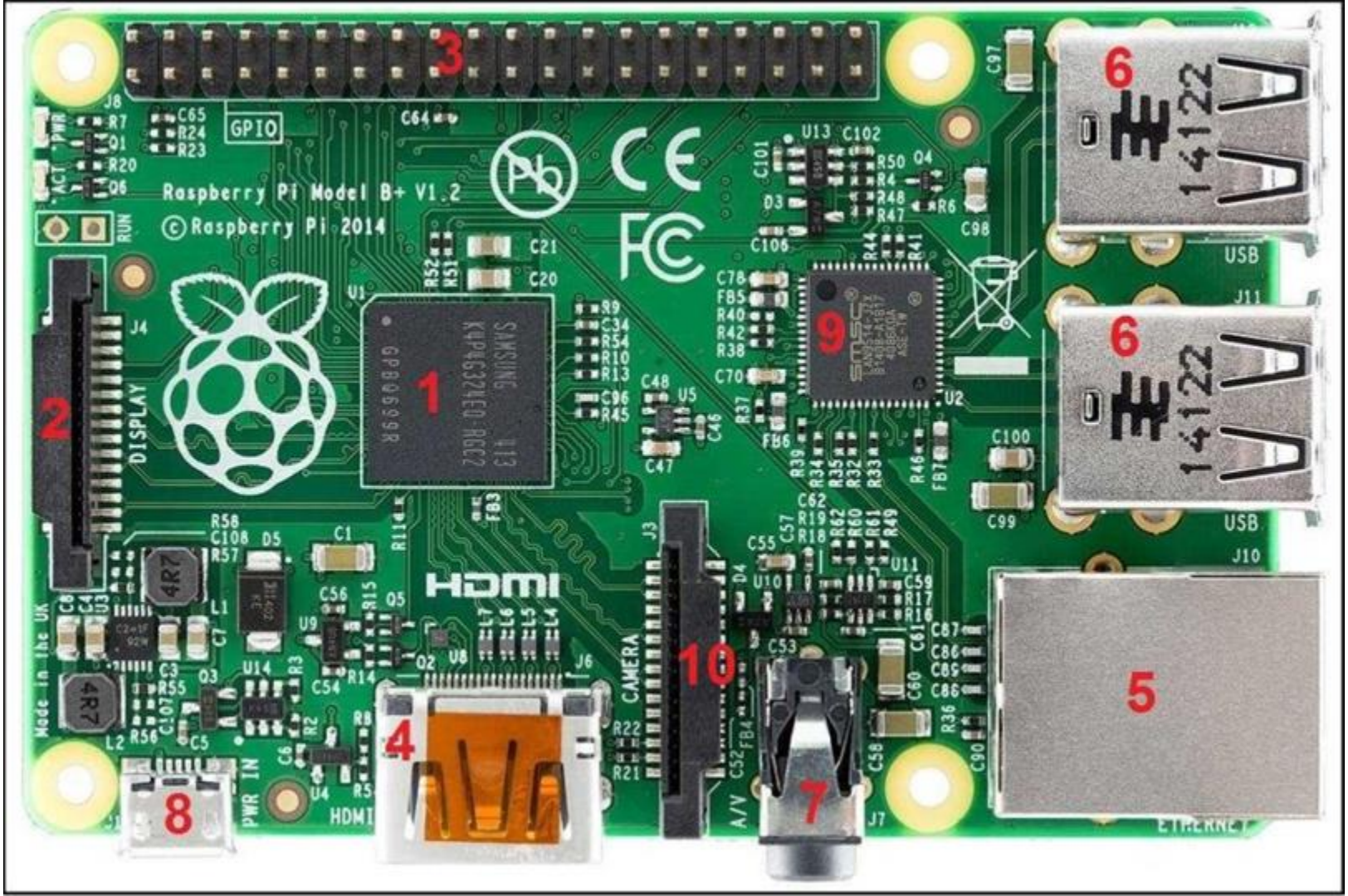
Pin Description of Raspberry Pi

- Basic ARM architecture, ARM organization core Data flow Model,
- ARM register organization, current program register organization.
- Pin configuration and architecture Arduino,
- Introduction to Raspberry Pi, Understanding SoC architecture and SoCs used in
- Raspberry Pi, Pin Description of Raspberry Pi,
- On-board components of Rpi
- Microcontroller Applications: Interfacing matrix keyboard and
- Seven segments LED display,
- LCD Interfacing, ADC Interfacing, DC motor interfacing.

On-board components of Rpi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GPIO
Raspberry Pi Model B+ V1.2
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DISPLAY
HDMI
CAMERA
USB
USB
PWR IN
HDMI
A/V
ETHERNET

On-board components of Rpi

1 – a system on a chip (SoC) – an integrated circuit that incorporates many computer components on a single chip – the CPU, memory, and RAM. The **Raspberry Pi B+** model uses the **ARM1176 700 Mhz** processor, the powerful **GPU (Graphical Processing Unit)** capable of playing HD videos, and **512 MB** of **RAM**.

2 – DSI display connector – used to attach an LCD panel. On the other side of the board is a **microSD** card slot that holds the operating system.

3 – GPIO (General-Purpose Input/Output) pins – pins used to connect electronics devices. The Raspberry Pi Model B has **26** pins, while B+ has **40**.

4 – HDMI port – used for connecting to a monitor or TV. HDMI can carry both sound and picture.

5 – Ethernet port – a standard **10/100 Mbit/s** Ethernet port used to connect your device with the rest of the network.

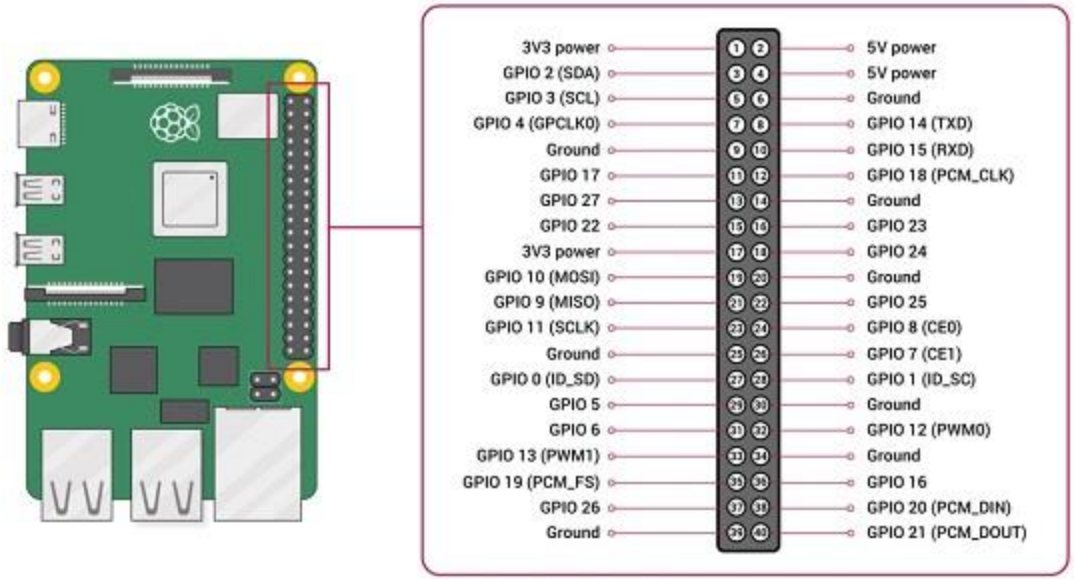
6 – USB ports – standard **USB 2.0** ports used to connect peripherals such as a keyboard and mouse. The Raspberry Pi Model B has **2** USB ports, while the B+ Model has **4**.

7 – Audio port – a **3.5mm** jack used to connect speakers.

8 – Micro-USB power connector – used to power the Raspberry Pi.

9 – USB and Ethernet interface chip

10 – Camera connector – enables the capturing of photographs and videos.


3V3 power
GPIO 2 (SDA)
GPIO 3 (SCL)
GPIO 4 (GPCLK0)
Ground
GPIO 17
GPIO 27
GPIO 22
3V3 power
GPIO 10 (MOSI)
GPIO 9 (MISO)
GPIO 11 (SCLK)
Ground
GPIO 0 (ID_SD)
GPIO 5
GPIO 6
GPIO 13 (PWM1)
GPIO 19 (PCM_FS)
GPIO 26
Ground
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
23 24
25 26
27 28
29 30
31 32
33 34
35 36
37 38
39 40
5V power
5V power
Ground
GPIO 14 (TXD)
GPIO 15 (RXD)
GPIO 18 (PCM_CLK)
Ground
GPIO 23
GPIO 24
Ground
GPIO 25
GPIO 8 (CE0)
GPIO 7 (CE1)
GPIO 1 (ID_SC)
Ground
GPIO 12 (PWM0)
Ground
GPIO 16
GPIO 20 (PCM_DIN)
GPIO 21 (PCM_DOUT)

GPIO Pinout

- One of the powerful features of the Raspberry Pi is the row of GPIO (general-purpose input output) pins and the GPIO Pinout is an interactive reference to these GPIO pins.
- A powerful feature of the Raspberry Pi is the row of **GPIO** (general-purpose input/output) pins along the extreme right edge of the board.
- Like every Raspberry Pi chipset, it consists of a 40-pin GPIO. A standard interface for connecting a single-board computer or microprocessor to other devices is through General-Purpose Input/Output (GPIO) pins.
- GPIO pins do not have a specific function and can be customized using the software.

5V: The 5v pins directly deliver the 5v supply coming from the mains adaptor. This pin can use to power up the Raspberry Pi, and it can also use to power up other 5v devices.

3.3V: The 3v pin is there to offer a stable 3.3v supply to power components and to test LEDs.

GND: Ground is commonly referred to as GND. All the voltages are measured with respect to the GND voltage.

- A GPIO pin that is set as an **input** will allow a signal to be received by the Raspberry Pi that is sent by a device connected to this pin.
- A voltage between 1.8V and 3.3V will be read by the Raspberry Pi as HIGH and if the voltage is lower than 1.8V will be read as LOW.
- A GPIO pin set as an **output** pin sends the voltage signal as high (3.3V) or low (0V).
- When this pin is set to HIGH, the voltage at the output is 3.3V and when set to LOW, the output voltage is 0V.

Along with the simple function of input and output pins, the GPIO pins can also perform a variety of alternative functions. Some specific pins are:

PWM (pulse-width modulation) pins:

- Software PWM is available on all pins
- Hardware PWM is available on these pins only: GPIO12, GPIO13, GPIO18, GPIO19

SPI pins:

SPI (Serial Peripheral Interface) is another protocol used for master-slave communication.

It is used by the Raspberry pi board to quickly communicate between one or more peripheral devices.

Data is synchronized using a clock (**SCLK** at GPIO11) from the master (RPi) and the data is sent from the Pi to our SPI device using the **MOSI** (Master Out Slave In) pin.

If the SPI device needs to communicate back to Raspberry Pi, then it will send data back using the **MISO** (Master In Slave Out) pin.

There are 5 pins involved in SPI communication:

- **GND**: Connect all GND pins from all the slave components and the Raspberry Pi 3 board together.

- **SCLK**: Clock of the SPI. Connect all SCLK pins together.
- **MOSI**: It stands for Master Out Slave In. This pin is used to send data from the master to a slave.
- **MISO**: It stands for Master In Slave Out. This pin is used to receive data from a slave to the master.
- **CE**: It stands for Chip Enable. We need to connect one CE pin per slave (or peripheral devices) in our circuit. By default, we have two CE pins but we can configure more CE pins from the other available GPIO pins.

SPI pins on board:

- **SPI0:** GPIO9 (MISO), GPIO10 (MOSI), GPIO11 (SCLK), GPIO8 (CE0), GPIO7 (CE1)
- **SPI1:** GPIO19 (MISO), GPIO20 (MOSI), GPIO21 (SCLK), GPIO18 (CE0), GPIO17 (CE1), GPIO16 (CE2)

I2C pins:

I2C is used by the Raspberry Pi board to communicate with devices that are compatible with Inter-Integrated Circuit (a low-speed two-wire serial communication protocol). This communication standard requires master-slave roles between both devices. I2C has two connections: **SDA (Serial Data)** and **SCL (Serial Clock)**. They work by sending data to and using the SDA connection, and the speed of data transfer is controlled via the SCL pin.

- **Data**: (GPIO2), Clock (GPIO3)
- **EEPROM Data**: (GPIO0), EEPROM Clock (GPIO1)

UART Pins:

Serial communication or the **UART** (Universal Asynchronous Receiver / Transmitter) pins provide a way to communicate between two microcontrollers or the computers.

TX pin is used to transmit the serial data and RX pin is used to receive serial data coming from a different serial device.

- TX (GPIO14)
- RX (GPIO15)

Thank You